AMENDMENT UNDER 37 CFR § 1.111
Serial No. 09/800,523

AMENDMENTS TO THE CLAIMS

This listing of the claims replaces all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

1. [Original] A method of framing a data signal received through a link of a communications network, the data signal comprising M (an integer, M>1) interleaved sub-streams, the method comprising steps of:

inverse multiplexing the data signal to generate M recovered sub-streams; and

detecting a respective unique synchronizing word in each of the recovered sub-streams within a predetermined search window.

2. [Original] A method as claimed in claim 1, wherein the width of the predetermined search window is determined using an expected delay between corresponding data units of a first interleaved sub-stream and a last interleaved sub-stream of the data signal.

3. [Original] A method as claimed in claim 2, wherein the search window corresponds to a portion of the data signal received during a period of up to twice an expected delay between corresponding data units of a first interleaved sub-stream and a last interleaved sub-stream of the data signal

4. [Original] A method as claimed in claim 1, wherein the step of detecting a unique synchronizing word comprises steps of:

searching each recovered sub-stream to detect a respective synchronizing word;

when a synchronizing word is detected in a sub-stream, asserting a respective individual frame found state for a first predetermined period of time; and

asserting a master frame found state if the individual frame found state is asserted in respect of all of the sub-streams within the predetermined search window.

5. [Original] A method as claimed in claim 4, wherein the first predetermined period of time is determined using an expected delay between corresponding data units of a first interleaved sub-stream and a last interleaved sub-stream of the data signal.

6. [Original] A method as claimed in claim 4, wherein the step of searching the data signal comprises, for each recovered sub-stream, steps of:

buffering a portion of the recovered sub-stream; and

comparing the buffered sub-stream data against each one of a set of predetermined unique synchronizing words, to detect a respective one of the set of predetermined unique synchronizing words in the recovered sub-stream.

7. [Original] A method as claimed in claim 6, wherein each synchronizing word comprises a non-unique position word and a non-unique identifier word, and the step of comparing the buffered sub-stream data against each one of a set of predetermined unique synchronizing words comprises steps of:

comparing the buffered sub-stream data against each one of a set of predetermined valid position words to detect a position word in the recovered sub-stream; and

when a position word is detected in the recovered sub-stream, comparing the buffered sub-stream data against each one of a set of predetermined valid identifier words to detect an identifier word in the recovered sub-stream.

8. [Original] A method as claimed in claim 4, wherein the step of asserting a respective individual frame found state comprises steps of:

de-asserting an individual Out-of-Frame flag associated with the respective recovered sub-stream; and

asserting information indicative of the synchronizing word detected in the respective recovered sub-stream.

9. [Original] A method as claimed in claim 8, further comprising steps of:

identifying a respective one of the interleaved sub-streams using the asserted information indicative of the synchronizing word detected in the recovered sub-stream; and

associating the identified interleaved sub-stream with the recovered sub-stream.

10. [Original] A method as claimed in claim 9, further comprising a step of reinitializing the search of the recovered sub-stream if the identified interleaved sub-stream has previously been associated with another one of the recovered sub-streams.

11. [Original] A method as claimed in claim 4, wherein the step of asserting a master frame found state comprises steps of:

monitoring a number of recovered sub-streams for which respective individual frame found states are simultaneously asserted;

detecting a location in the data signal at which individual frame found states are simultaneously asserted in respect of at least N (an integer $1<N<M$) of the M recovered sub-streams;

asserting the search window bracketing the detected location at which individual frame found states are simultaneously asserted in respect of at least N of the recovered sub-streams; and

asserting a master frame found state if individual frame found states are asserted in respect of all of the recovered sub-streams within the asserted search window.

12. [Original] A method as claimed in claim 11, wherein the value of N is determined using an expected probability of an individual frame-found state being incorrectly asserted in respect of any one of the M recovered sub-streams.

13. [Original] A method as claimed in claim 12, wherein N is 4.

14. [Original] A method as claimed in claim 11, wherein the step of searching each one of the M recovered sub-streams comprises, for a recovered sub-stream in

respect of which an individual frame-found state has not been asserted, a step of narrowing the search of the recovered sub-stream to the portion of the recovered sub-stream within the asserted search window.

15. [Original] A method as claimed in claim 11, further comprising a step of restarting framing of the data signal if the master frame found state is not asserted within a second predetermined period of time.

16. [Original] A method as claimed in claim 15, wherein the second predetermined period of time comprises a predetermined number of frames following a first assertion of the search window.

17. [Original] A method as claimed in claim 16, wherein the predetermined number of frames is determined using an expected probability of the frame-possible state being incorrectly asserted.

18. [Original] A method as claimed in claim 16, wherein the predetermined number of frames is ten.

19. [Currently Amended] A synchronizing word adapted for uniquely identifying a respective one of M (an integer, M>1) sub-streams interleaved within a data signal, the synchronizing word comprising:

a non-unique position word having a ~~significant~~ hamming distance, relative to a shifted version of itself, that is at least ½ of a maximum theoretically possible hamming distance, based on a length of the position word; and

a non-unique identifier word selected from a set of predetermined identifier words, the identifier word having a ~~significant~~ hamming distance, relative to each of the other identifier words in the set, that is at least ½ of a maximum theoretically possible hamming distance, based on a length of the identifier word.

20. [Original] A synchronizing word as claimed in claim 19, wherein a bit pattern of the synchronizing word is selected such that an energy spectrum of respective

synchronization words of each of the sub-streams interleaved within the data signal is substantially white.

21. [Original] A synchronizing word as claimed in claim 19, wherein respective lengths of the position and identifier words are selected using one or more of:

a probability of incorrectly detecting the synchronizing word in the data signal; and

a mean time to correctly declare the master frame found state.

22. [Original] A synchronizing word as claimed in claim 21, wherein the position word has a length of at least 16 bits, and at most 32 bits.

23. [Original] A synchronizing word as claimed in claim 21, wherein the respective hamming distances of the position and identification words are selected using an expected bit error rate (BER) of the data signal.

24. [Original] A synchronizing word as claimed in claim 23, wherein the expected BER is about 0.05, or less.

25. [Original] A synchronizing word as claimed in claim 24, wherein the hamming distance of the position word is about 10.

26. [Original] A synchronizing word as claimed in claim 24, wherein the length of the identification word is about 10 bits and the hamming distance of the identification word is about 5.

27. [Original] A framer adapted for framing a high error rate data signal received through a link of a communications network, the data signal comprising M (an integer, M>1) interleaved sub-streams, the framer comprising means for detecting a respective unique synchronizing word in each one of M recovered sub-streams extracted from the data signal, within a predetermined search window.

28. [Original] A framer as claimed in claim 27, wherein the width of the predetermined search window is determined using an expected delay between

corresponding data units of a first interleaved sub-stream and a last interleaved sub-stream of the data signal.

29. [Original] A framer as claimed in claim 28, wherein the search window corresponds to a portion of the data signal received during a period of up to twice an expected delay between corresponding data units of a first interleaved sub-stream and a last interleaved sub-stream of the data signal

30. [Original] A framer as claimed in claim 27, wherein the means for detecting a unique synchronizing word comprises:

a respective individual framer including:

means for searching each recovered sub-stream to detect a respective synchronizing word; and

means for asserting a respective individual frame found state for a first predetermined period of time when a synchronizing word is detected; and

a master framer adapted for asserting a master frame found state if the individual frame found state is asserted in respect of all of the sub-streams within the predetermined search window.

31. [Original] A framer as claimed in claim 30, wherein the first predetermined period of time is determined using an expected delay between corresponding data units of a first interleaved sub-stream and a last interleaved sub-stream of the data signal.

32. [Original] A framer as claimed in claim 30, wherein the means for searching each recovered sub-stream comprises:

a buffer adapted for buffering a portion of the recovered sub-stream; and

means for comparing the buffered sub-stream data against each one of a set of predetermined unique synchronizing words, to detect a respective synchronizing word in the recovered sub-stream.

33. [Original] A framer as claimed in claim 32, wherein each synchronizing word comprises a non-unique position word and a non-unique identifier word, and the means for comparing the buffered sub-stream data against each one of a set of predetermined unique synchronizing words comprises steps of:

a first comparator adapted to compare the buffered sub-stream data against each one of a set of predetermined valid position words to detect a position word in the recovered sub-stream; and

a second comparator responsive to detection of a position word in the recovered sub-stream, for comparing the buffered sub-stream data against each one of a set of predetermined valid identifier words to detect an identifier word in the recovered sub-stream.

34. [Original] A framer as claimed in claim 30, wherein the means for asserting a respective individual frame found state comprises:

means for de-asserting an individual Out-of-Frame flag associated with the respective recovered sub-stream; and

means for asserting information indicative of the synchronizing word detected in the respective recovered sub-stream.

35. [Original] A framer as claimed in claim 34, further comprising:

means for identifying a respective one of the interleaved sub-streams using the asserted information indicative of the synchronizing word detected in the recovered sub-stream; and

means for associating the identified interleaved sub-stream with the recovered sub-stream.

36. [Original] A framer as claimed in claim 35, further comprising means for restarting the individual framer if the identified interleaved sub-stream has previously been associated with another one of the recovered sub-streams.

37. [Original] A framer as claimed in claim 30, wherein the master framer comprises:

means for monitoring a number of recovered sub-streams for which respective individual frame found states are simultaneously asserted;

means for detecting a location in the data signal at which individual frame found states are simultaneously asserted in respect of at least N (an integer $1<N<M$) of the M recovered sub-streams;

means for asserting the search window bracketing the detected location at which individual frame found states are simultaneously asserted in respect of at least N of the recovered sub-streams; and

means for asserting a master frame found state if individual frame found states are asserted in respect of all of the recovered sub-streams within the asserted search window.

38. [Original] A framer as claimed in claim 37, wherein the value of N is determined using an expected probability of an individual frame-found state being incorrectly asserted in respect of any one of the M recovered sub-streams.

39. [Original] A framer as claimed in claim 38, wherein N is 4.

40. [Original] A framer as claimed in claim 37, wherein each individual framer comprises means for narrowing the search of the respective recovered sub-stream to the portion of the recovered sub-stream within the asserted search window.

41. [Original] A framer as claimed in claim 37, further comprising means for restarting the framer if the master frame found state is not asserted within a second predetermined period of time.

42. [Original] A framer as claimed in claim 41, wherein the second predetermined period of time comprises a predetermined number of frames following a first assertion of the search window.

43. [Original] A framer as claimed in claim 42, wherein the predetermined number of frames is determined using an expected probability of the frame-possible state being incorrectly asserted.

44. [Original] A framer as claimed in claim 42, wherein the predetermined number of frames is ten.

45. [Currently Amended] A method of transporting a data signal comprising a plurality of interleaved sub-streams through a link of a communications network, each sub-stream being uniquely identified by a respective synchronization word inserted into the respective sub-stream prior to interleaving the sub-streams into the data signal, wherein a bit pattern of each ~~synchronizing~~ synchronization word is selected such that an energy spectrum of the plurality of respective synchronization words interleaved within the data signal is substantially white.